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ABSTRACT

The booklet describes the program offerings, requirements, training, and pay schedules of the Langley Research Center Technician Training Program. Training schedules and the duties expected upon completion of each of the training areas are specified, along with on-the-job and academic requirements. The areas of training are: engineering draftsman, engineering technician (aircraft operation), electrical engineering technician, electronics engineering technician, engineering technician (fabrication), engineering technician (research facilities), materials engineering technician, mechanical engineering technician, and engineering technician (model-aerospace). Information is also provided about employment and selection of technicians, credit for previous education, length of training, advancements, promotion, and certification. The objective of the training program is to prepare technicians in fields which have particular application to the research and development needs of NASA. (NJ)

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ENGINEERING TECHNICIAN STANDARDS

July 12, 1973

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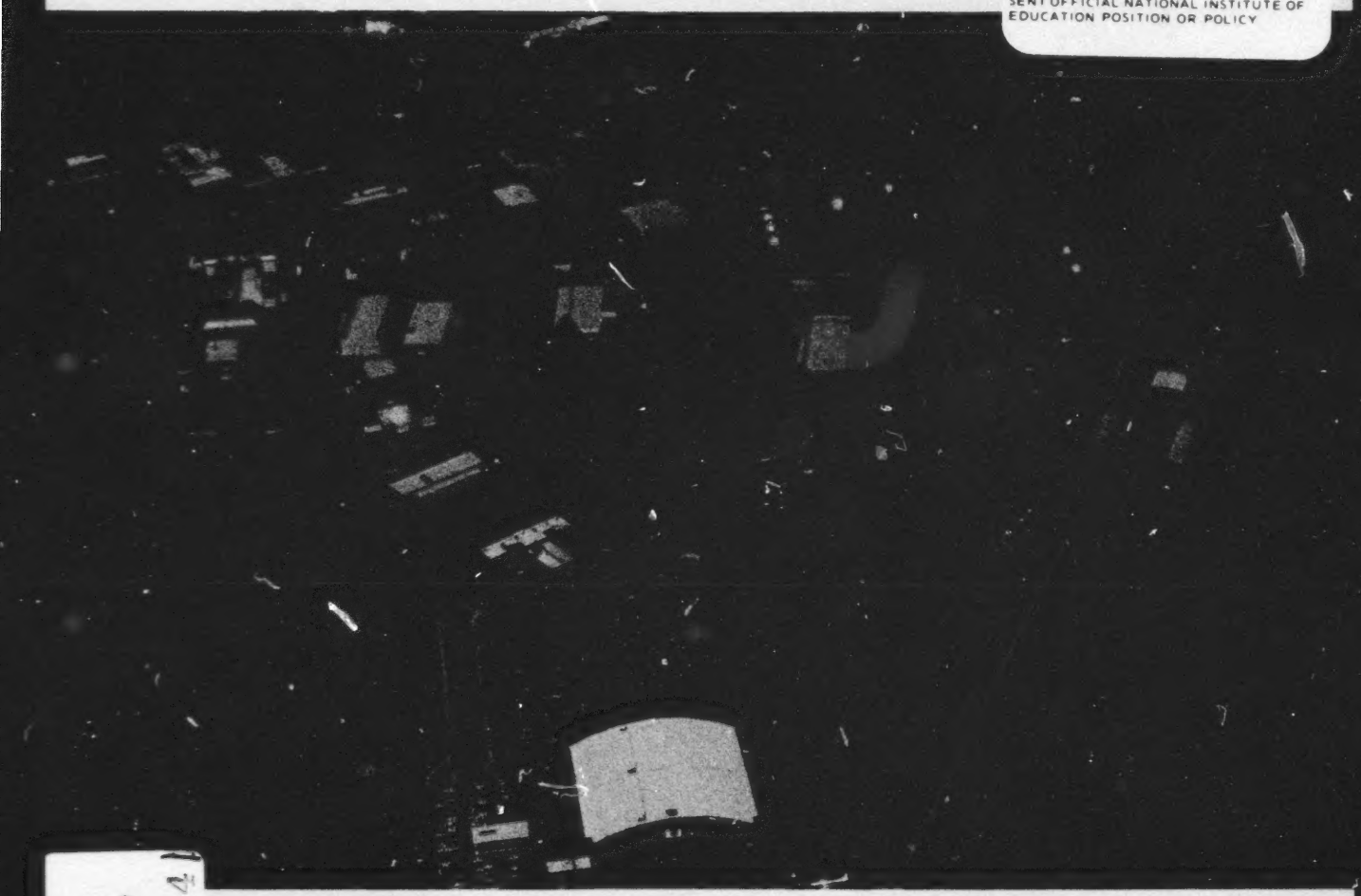

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Hampton, Virginia

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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VT 102 810

TECHNICIAN STANDARDS

1. Objective

The objective of the Langley Research Center Technician Training System is to provide technicians who are prepared by organized on-the-job and classroom training to be potential leaders in those fields which have particular application to the research and development needs of NASA.

2. Responsibility for Operation of Technician Training System

The Director, Langley Research Center, is responsible for the operation of the Technician Training System. All changes and additions to the policies, regulations, and procedures of this system must be approved by the Director and by NASA Headquarters. The Director shall also approve recommendations of technicians for completion.

3. Advisory Committee on Technician Training

(a) There shall be an Advisory Committee on Technician Training composed of the Director for Systems Engineering and Operations, Chairman; the Head, Training and Educational Services Branch, Secretary; the Personnel Officer; an employee-member designated by the NASA Langley Lodge 892, International Association of Machinists and Aerospace Workers; an employee-member designated by the Patternmaker's League of North America, Newport News Association; an employee-member designated by Local 2755, American Federation of Government Employees; and other members designated by the chairman composed of the heads of organizations to which large numbers of technicians are assigned. This committee will consider proposals and make recommendations to the Director, or his designated representative, concerning the selection, training, and completion of technicians; changes and additions to the policies, regulations, and procedures governing the Technician Training System, and to the content of the training program; and will periodically review the administration and operation of the Technician Training System. Ordinarily, this committee will meet once a year prior to the Technician Completion Ceremony. However, the Chairman may call other meetings during the year as the need arises.

(b) As deemed necessary by the Chairman, Advisory Committee on Technician Training, and the Head, Training and Educational Services Branch, the advisory services of the Bureau of Apprenticeship and Training, U. S. Department of Labor, shall be utilized.

4. Administration

The administration of the Technician Training System is the responsibility of the Head, Training and Educational Services Branch, Personnel Division, who, subject to review by the Advisory Committee on Technician Training, shall perform the following duties in conjunction with operating officials.

(a) Direct and plan technician training in the operating units and in the classrooms.

(b) Determine type of training to which a new technician will be assigned.

(c) Recommend to the Advisory Committee on Technician Training such additional policies, regulations, and operating procedures as may be found necessary in carrying out the objectives of this training system.

(d) Rotate technicians from one type of work to another in accordance with the schedules specified in these standards.

(e) Assure that adequate procedures exist for determining that the work performance and classroom work of a technician are satisfactory.

(f) Certify those technicians who are eligible for a grade promotion, and recommend technicians for discharge.

(g) Maintain records relating to the progress of technicians in the operating units and in the classrooms.

(h) Prepare periodic reports based on these records for transmittal to the Advisory Committeee on Technician Training.

(i) Certify those technicians who have satisfactorily completed their training.

(j) Keep the Bureau of Apprenticeship and Training informed of the training activities at Langley Research Center, including a current record of the technicians being trained and those who have completed their training or whose training has been terminated before completion.

5. Employment of Technicians

The Langley Research Center shall maintain a sufficient quantity of apprentice technicians to supply a reasonable number of journeymen technicians for scheduled expansion or normal turnover in the technical fields. The ratio shall not exceed one technician to three journeymen. To insure that there will be no discrimination on the basis of race,

religion, color, national origin, sex, or physical handicap, selection of technicians under this program shall be made on the basis of qualifications alone in accordance with objective standards which permit review after full and fair opportunity for application. This program shall operate on a completely nondiscriminatory basis.

6. Selection of Technicians

Technicians shall be selected from lists of eligibles resulting from an appropriate Civil Service Examination or in accordance with special authorities such as Veterans Readjustment Appointments.

7. Credit for Previous Education

Credit will be allowed for prior classroom instruction when the technician passes an exempting examination in the specific courses of related instruction.

8. Length of Training

(a) The length of training covered by these Standards shall be as follows:

Types of training	On-the-job training (years)	Minimum related instruction (hours)
Engineering Draftsman	5	1110
Aerospace Engineering Technician	5	1122
Electrical Engineering Technician	5	1300
Electronics Technician	5	1300
Engineering Technician (Fabrication Development)	5	1122
Engineering Technician (Facilities Operations)	5	1122
Engineering Technician (Materials Processes)	5	1122
Engineering Technician (Mechanical Development)	5	1122
Engineering Technician (Aerospace Model Development)	5	1122

(b) The term of training shall be divided into periods of one year each. Absence from duty on annual leave, sick leave, court leave, military leave, or leave without pay will be considered as time toward completion of the training period unless the combined total of such absence is in excess of 39 days in any year, in which case advancement to the succeeding period will be delayed by the number of days of absence from duty in excess of 39 days.

9. Schedule of On-the-Job Training

Technicians shall receive on-the-job training as specified in the attached schedules.

10. Related Instruction

(a) Technicians shall be required to attend classes as directed by the Head, Training and Educational Services Branch for a minimum of 222 hours during each year of the term of training. Credit will be allowed for approved absences.

(b) Courses in related study will be given during two semesters or three quarters of each year. Technicians will be required to take four semester length courses or six quarter length courses or the equivalent each year.

(c) Related instruction shall be given technicians while in a duty status. Adequate classrooms and labs shall be provided. Thirty minutes travel time each way shall be allowed for Thomas Nelson Community College classes. All classroom absences will be charged to an appropriate leave.

11. Related Instruction Grades

Technicians shall be graded by the instructor upon the completion of each course. The grading system shall be as follows:

A - Excellent	90-100	4 points
B - Good	80-90	3 points
C - Average	70-80	2 points
D - Poor	60-70	1 point
F - Failure	Below 60	0 point

12. Safety Training

Technicians will receive First Aid and Safety Training as a part of formal related study instruction and further training in these areas will be given on-the-job.

13. Class Advancements and Promotion

(a) Normally, new technician classes shall be organized at intervals timed to coincide with regular school semesters or quarters.

(b) Technicians who satisfactorily complete both on-the-job training and related classroom studies shall, on the completion of the required time, be advanced to the succeeding grade as indicated below:

13b (Cont.)

Grade	Promotion schedule
GS-2	Entrance salary
GS-3	Completion of six months
GS-4	Completion of 1-1/2 years
GS-5	Completion of 2-1/2 years
GS-6	Completion of 3-1/2 years
GS-7	Completion of 4-1/2 years

(c) Academic Probation

Any student who receives a final grade below a "C" in any course will be placed on academic probation. No promotions will be effected while technician is in a probationary status. To remove an academic probation, the course or a suitable substitute approved by the Head, Training and Educational Services Branch in consultation with the technician's Branch Head, must be made up on technician's time and at technician's expense, and during the succeeding quarter or semester.

(d) Appraisal of on-the-job Performance

A technician's work performance on the job is to be reviewed by his supervisor on a quarterly basis. When his work performance is regarded as marginal during a quarter, the technician's deficiencies are to be discussed with him. If the deficiencies are not corrected during the following quarter, he shall be considered unsatisfactory.

14. Removal

Any technician who fails to make satisfactory progress in either classroom studies or on-the-job performance shall be removed from his position at the Center. Unsatisfactory progress is defined as:

(a) Failure to remove academic probation during the succeeding quarter or semester.

(b) Receiving a grade average below "C" (2.0) for one academic year, including the summer term for make-up purposes. The average shall be computed using the following point system: A=4; B=3; C=2; and D=1.

(c) Failure to correct deficiencies as stated in 13d above.

15. Certificate of Completion of Training

Technicians who have satisfactorily completed five years of training shall be awarded a certificate, issued jointly by the NASA and the Bureau of Apprenticeship and Training, U. S. Department of Labor.

15. Certificate of Completion of Training (Continued)

Certificates of Completion will be awarded each year to those technicians who have completed their training during the preceding 12-month period.

16. Modification of Standards

These standards may be revised from time to time as operating conditions and experience demand, but all such revisions shall be submitted by the Advisory Committee on Technician Training for approval of the Director, Langley Research Center; the Director of Personnel, NASA Headquarters; and the Bureau of Apprenticeship and Training, U. S. Department of Labor. Any labor organization recognized by the Langley Research Center will be given an opportunity to comment on any revisions to these standards prior to their approval. Copies of all revisions will be furnished to all parties concerned and to interested labor organizations.

SCHEDULE OF TRAINING

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ENGINEERING DRAFTSMAN

The Engineering Draftsman Program shall be considered completed when the employee has satisfactorily finished approximately 5 years of specified training and related study, including 8,890 hours of work experience and 1,110 hours of classroom instruction. This training shall be offered only to those who have completed 2-1/2 years of training with superior performance in one of the other types of training. Langley Merit Promotion Plan procedures are followed in making selections for this program.

Upon completion of the training, the draftsman shall be capable of performing the following duties:

(1) In one of the several fields of engineering under the supervision of an engineer, working from rough sketches, general specifications, or oral instructions, assists in planning the design, makes preliminary layouts and detail drawings, writes detailed specifications, and reviews contractor drawings for the following types of work: (a) research models scaled for structural, aerodynamic, and thermodynamic aerospace research, (b) support systems and controls for the remote and precise positioning of models and other research tests. These include magnetic or mechanical supports with electrical, hydraulic, and pneumatic drives and controls, (c) research tunnels systems to cover the subsonic through hypersonic range including wind-tunnel structures, drives, fan blades, gas pressurization, heating, drying, storage, and controls, (d) environmental test facilities including vacuum, thermal acceleration noise, and similar environments, (e) simulator facilities for study of vehicle guidance systems, human response, and man-machine integration, (f) laboratory facilities including the buildings, utilities, and traffic systems, and (g) free-flight vehicles such as rocket boosters and spacecraft including several complex and high-reliability systems such as instrumentation, electrical, pyrotechnics, guidance, and control in sizes ranging from small probes to orbital space vehicles.

(2) Computes and calculates mathematical problems pertaining to engineering drafting work, such as weights, moments, simple stresses in tension and compression, simple beams, pressure differentials, spring loads, etc.

(3) Checks drawings for completeness and correctness of views, dimensions, standard drafting room practice; incorporates changes and modifications in existing drawings; prepares cost estimates; keeps applicable records and data; compiles assemblies and parts lists.

(4) Directs lower grade Draftsmen on detail work, and performs related duties as assigned.

Engineering Draftsman shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation period		250
2-1/2 years of superior performance as a trainee in one of the other fields of training	4,360	
Drafting		
Making alterations and corrections to drawings	480	
Detail drawings	1,600	
Layout, detail design, and component development	1,600	
Elementary engineering calculations	600	8,640
		8,890
Related technical instruction		1,110
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Draftsman masters the various phases of his training, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Aircraft-Operations)

The Engineering Technician Program (Aircraft-Operations) shall be considered completed when the trainee has satisfactorily finished approximately 5 years of specified training and related study, including 8,878 hours of shop experience and 1,122 hours of classroom instruction.

Upon completion of his training, the employee shall be capable of performing the following duties:

(1) Engage in work assignments which typically represent a limited part of a phase of a broader assignment. The assignments are selected to diversify the trainee experience base and knowledge of a wide variety of conventional, unorthodox, and prototype airframes, engines, aircraft systems, equipment, accessories and components which constitute these aircraft used as flying laboratories.

(2) Work assignment is received either from a technician project leader or immediate supervisor, with assignment clearly defined as to limits of the trainee's commitment. Assignment is generally verbally reviewed with the selection and alteration of and to material, equipment, circuitry, instrumentation, control system linkages, and cabling, etc., to accomplish his mission. Finally, completed work is reviewed for suitability, practicability, adequacy, flight safety, and airworthiness.

(3) Receives work assignments that provide opportunity to work with total aircraft and aircraft systems, i.e., structural, electrical, electronic, hydraulic, high pressure, oxygen systems, fuel, reaction control, automatic controls, temperature control and others. In all work has occasion, on a limited basis, to work with engineers on project requirements that require him to initiate, devise, implement, modify and design parts, tooling and fixtures, simple instrumentation, and the like. Also may be required to develop revisions to standard work methods and procedures to accomplish work on certain research engendered practices.

(4) Selects the most appropriate procedure or method from a variety of standard approaches that provide the best solution to his problem. In addition to his primary research and development work, and as a subordinate and secondary assignment, Technician will perform the normal repair, maintenance, preflight, acceptance and postflight service that must be performed on operational aircraft to maintain a high level of flight qualification, safety, and airworthiness. Also makes T.O. changes as required on aircraft. This secondary work must be performed by the Technician because previous or customary maintenance, service, and repair as performed on conventional aircraft generally have to be modified to suit the unorthodox nature of most of the Langley Research Center aircraft.

Engineering Technician (Aircraft-Operations) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation period		250
Shop practice		480
(a) Sheet metal work	160	
(b) Welding shop	40	
(c) Material processing	80	
(d) Machine shop	160	
(e) Soldering school	40	
General engine repair including jets inspection and servicing	1,800	
Propeller inspection and servicing	320	
Magnetos, ignition systems and engine analyzers - basic electric electronic installations	654	
Fuel systems	500	
Removal, inspection, and overhaul of engine accessories (reciprocal and jet)	500	
Engine troubleshooting and test runs, jet trim checks	774	
Airplane disassembly and cleaning, fuselage repair and alinement, wing and surface repair wire and cable work, landing gear repair and installation, instrument installation. Rotary wing, V/STOL component balancing, alinement, and tracking	2,900	
Daily and preflight inspections, troubleshooting, and correction of flight discrepancies	700	
		8,878
Related technical instruction		1,122
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his trade, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Electrical)

The Engineering Technician Program (Electrical) shall be considered completed when the trainee has satisfactorily finished approximately 5 years of specified training and related study, including 8,700 hours of shop experience and 1,300 hours of classroom instruction.

Upon completion of his training, the employee shall be capable of performing the following duties:

Under the supervision of a higher level technician, supervisor, or an electrical engineer, from schematic and wiring diagrams, a description of the process being controlled, and a discussion of the operational problem occurring in the system:

(1) Makes the necessary analysis to pinpoint the trouble area, and on small, less complex-low voltage systems takes the necessary steps to isolate, locate, and correct the malfunction.

(2) On more complex control systems involving high-cost equipment or where man-rated equipment is involved or where high-voltage systems may be involved, performs analysis and study of the problem as in (1) above, but before proceeding with any corrections or energizing of equipment must review entire problem with his supervisor and obtain further direction.

(3) Selects, installs, and utilizes the basic instruments necessary to pinpoint trouble areas in various control systems of limited complexity or to verify the performance of such properly operating systems.

(4) Makes analysis of systems such as in (1) above to assure operation of all components are within proper rating and performs the necessary load study and other calculations as required.

(5) Makes up equipment or prepares sketches to have others make up devices, components, and hardware such as ac or dc power supplies; special panels, transformers, contactors, motor starters, switches, timers; voltage, current, or speed controllers; limit switches, etc. Also may modify, alter, or adapt equipment as above to give predetermined operating characteristics. Work such as described is built up for system, subsystem, and special equipment such as vacuum chambers, angle-of-attack devices, sting and schlieren controls; camera controls, instrumentation, and recording devices and other equipment.

(6) Disconnects, disassembles, checks out, reassembles, or installs precision electrical control devices and adapts and modifies circuitry and electrical hardware and components to give desired and specified operating parameters.

(7) Performs other related duties as required.

Engineering Technician (Electrical) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation period		250
Electrical installation, repair, and maintenance of the following equipment:		
Building light and low voltage power	1,000	
Storage batteries, charging and maintenance	250	
Machine tools, industrial ovens, vacuum systems, etc.	1,276	
Heating and refrigeration	500	
		3,026
Space vehicle systems, data processing systems		1,300
General electronics construction maintenance, repair electronic shakers, process control systems		1,400
High-voltage distribution systems and general shop work		674
Wind-tunnel drives and auxiliary equipment		1,800
Servicing and repairing instruments		250
		8,700
Related technical instruction		1,300
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his training, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Electronics)

The Engineering Technician Program (Electronics) shall be considered completed when the training and related study, including approximately 5 years of specified training and related study, 8,700 hours of practical experience, and 1,300 hours of classroom instruction, has been accomplished.

Upon completion of his training, the Technician shall be capable of performing the following duties:

(1) Under the supervision of an engineer; from rough sketches, mathematical formulae, or functional circuit diagrams, general specifications, or oral instructions, perform the necessary electrical, electronic, mechanical, electro-optical, and/or electromechanical laboratory work and detailed designs and computations needed to bring to realization the concepts of the professional. Understands and is capable of generating digital circuits, logical design, analysis of input-output devices, control and arithmetic units, analysis of networks containing both active and passive elements. Designs amplifiers of both solid state and vacuum tube types for use from dc to rf frequencies, and is capable of constructing both linear and nonlinear wave-shaping circuits, feedback systems, static and dynamic controls and analysis of involved circuits including pulsing and switching systems as used with lasers and photomultiplier apparatus. Understands and is able to apply basic physics principles to concepts furnished by professionals.

(2) Accomplishes detailed design and fabricates instrumentation, including mechanical arrangement of components with proper consideration for electrical, magnetic and optical interferences, crosstalk, and spurious coupling.

(3) Assists engineer in development of new instruments; brings to bear on the problems his practical experience and knowledge, maintains repairs, modifies and improves such instruments and devices as pressure gauges, spectrographs, amplifiers, oscillators, force balances, digital and analog systems, optical-electronic apparatus, and vacuum gauges.

(4) Develops prototypes from rough sketches, and/or verbal instructions, installs and adjusts aircraft and missile instrumentation in test facilities, reduces data obtained during tests and calibrations including computer programing for extensive data.

(5) Maintains, repairs, and modernizes electronic instrumentation such as oscilloscopes, test and calibration sets, vacuum and cryogenic devices, computers, radio communications, and telemetry apparatus. Understands and can generate optical, vacuum, and mechanical systems under the direction of the engineer, including interfaces with electrical and electronic control and recording devices.

(6) Working with the engineer, constructs, tests, installs, and calibrates special test apparatus such as regulated power supplies, discriminators, integrators, converters, and remote sensing and telemetering systems.

(7) Assists engineer in making field setups of instruments such as hot-wire anemometers, laser radars, small particle samplers, vacuum gauges, X-ray gas density devices, plasma generators, telescopic apparatus, and the mechanical mounts and adjustments required.

(8) Performs other duties as required.

The Engineering Technician (Electronics) trainee shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)
Orientation period	250
Layout, drilling, tapping, and finishing chassis and panels of instrumentation and cabinets; layout of precision mechanical systems and optical arrangements	1,472
Construction, wiring, calibrating, testing, and operating radio, telemetering, ultra-high frequency, and other electrical and electronic test equipment	740
Assisting in the conduct of tests and experiments, preparing circuit diagrams, making laboratory setups, recording and working up data	1,262
Altering and adjusting radio, ultrahigh frequency, miscellaneous electronic and electrical equipment, and associated optical and mechanical instrumentation including interface equipment	1,370
Wiring, repairing, modifying, debugging, and elementary programing of computers	740
Detailing, constructing, adjusting and calibrating cryogenic and vacuum instrumentation, mechanical and optical devices	740
Constructing, testing, adjusting, installing, and maintaining electromechanical gauges, electro-optical sensors, and other direct and remote facilities instrumentation, including optical systems	740

Training schedule	Time breakdown (approx. hours)	
Detailed circuit design and construction of pulsing and counting circuits, alinement and tests of laser systems, and of electron beam apparatus including spectrographs, as well as the mechanical mounts and adjustments for the apparatus	740	
Servicing and repairing instruments	446	
Calibrating instruments	200	8,450
		8,700
Related technical instruction including associated laboratory classes		1,300
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his training, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Fabrication)

The Engineering Technician Program (Fabrication) shall be considered completed when the trainee has satisfactorily finished 5 years of specified training and related study including 8,878 hours of shop experience and 1,122 hours of classroom instruction.

Upon completion of his training, the employee shall be capable of performing the following duties:

(1) Performs experiments that require a knowledge of the characteristics and properties of materials, metals, alloys, superalloys, composites, etc., and applies this working knowledge to develop and fabricate the finished product that meets space-age hardware, model, and flight vehicle requirements. His awareness of the compatibility or incompatibility of metals and materials both to themselves and their environment is a necessity.

(2) Collaborates with supervisors, engineers and scientific personnel with regards to the design problems. Participates in predesign discussions, feasible design approach, fabrication technique, tooling requirements, methods of performing the work and many other problems of completing a project.

(3) Studies designated material brochures, manuals, fact sheets, etc., relative to new materials and fabrication techniques adaptable to current and future needs and applies such knowledge to work assignments. Utilizes the standard as well as the new and sophisticated methods of joining materials, e.g., diffusion bonding, electron beam, laser, and solid state welding.

(4) Frequently is required to produce detailed drawings and does the simple engineering calculations necessary. Does the required liaison to coordinate his efforts and those of others to accomplish his assigned project. Keeps records and makes notes on work performed, observations made, data taken, and makes initial summaries.

(5) As a coordinating technician, plans the sequence of conventional or nonconventional operations, selects materials to meet requirements, calculates precision dimensions, sizes, weights, measurements, etc., designs and constructs tools, fixtures, and other holding, positioning, supporting or warpage control devices that may or may not conform to existing and precedented patterns.

(6) Destructive and nondestructive testing, metallography and qualitative chemical analysis of materials will constitute part of his normal duties.

Engineering Technician (Fabrication) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)
Orientation period	250
Machinery, tools, and precision instruments	1,400
Fabrication of flight hardware, models, structural and material specimens, construction and repair of research equipment, systems and facilities	3,474
Design and fabrication of tooling	900
Detail drawings, pattern and template development, layout work	900
Materials and methods research and development, testing, records, data and documentation	1,754
Technology utilization lectures	200
	8,878
Related technical instruction	1,122
TOTAL	10,000

Dependent upon the workload of the Center and the speed with which the technician masters the various phases of his trade, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Research-Facilities)

The Engineering Technician Program (Research-Facilities) shall be completed when the trainee has satisfactorily finished approximately 5 years of specified training and related study including 8,878 hours of shop experience and 1,122 hours of classroom instruction.

Upon completion of his training, the technician shall be capable of performing the following duties:

(1) Assists supervisor or researcher in setting up general test conditions and test facility operations. Introduces various environments into the test facility (nitrogen, helium, methane, hydrogen, etc.) through various pumping and compressor systems. Insures for proper temperature, pressures, and velocities to meet these requirements.

(2) Assists in the preparation of test object and/or test environment. Calibrates and pretests instrumentation, including installation of instrumentation on the test object. Instrumentation generally is electronic, electrical, and hydraulic in nature to obtain vacuum pressure, thermal, radiation, velocity and similar readouts integrated with computer and other unique recording devices.

(3) Is assigned to perform a specific test function or test facility operation. Operates necessary controls, recorders and other devices pertinent to the test. Monitors his specific test function, performance and operation, and advises of any in-progress test malfunctions.

(4) Collects, reviews, and assists in evaluating data. Advises researcher on the reliability or deficiencies of the test data based on any notable deviations in readouts or gauges.

(5) Sets up new or corrective test conditions either to compensate for any deficiencies or to get more intense or precise data. Assists in precise and sequential deactivation of test facility to insure for passive neutralization of hostile and extremely hazardous environments and conditions.

(6) Performs skilled mechanical work in designing and fabricating mountings, test fixtures, etc., and modifying instrumentation to meet test requirements. Also makes modifications to test facility systems and subsystems, or assists in updating test facility performance.

Engineering Technician (Research-Facilities) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule		Time breakdown (approx. hours)
Orientation period		250
Use of precision measuring instruments, operation of power tools, soldering, brazing, etc.	2,000	
Test apparatus and associated machinery operation, inspection, and routine maintenance	1,250	
Installation and calibration of equipment and systems for controlling, transmitting, indicating and recording test data	1,704	
Test vehicle assembly, installation, and modification	1,300	
Assisting in conduct of test programs, operating of control systems, recording and working up data	2,374	8,628
		8,878
Related technical instruction		1,122
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his trade, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

MATERIALS ENGINEERING TECHNICIAN

The Engineering Technician Program (Materials-Development) shall be completed when the trainee has satisfactorily finished approximately 5 years of specified training and related study including 8,878 hours of practical experience and 1,122 hours of classroom instruction.

Upon completion of his training, the technician shall be capable of performing the following duties:

(1) Works with basic metals, polymers, ceramics, fabrics, rubber, resins, refractory materials, and other synthetics with the objective of processing and applying materials utilizing conventional concepts and technology to meet specific research needs. Works with materials in various physical states (solids, liquid, etc.). May suggest alternate processes or techniques relative to a more feasible or practical method of processing or applying materials to a specific problem or assignment.

(2) Subject materials to conventional processing techniques, such as heating, cooling, laminating, curing, bonding, coating, and other processes. Observes and assists in determining the effects and influences of processing on materials subjected to hostile environments by accurately recording his observations. Operates materials treatment and processing equipment as necessary, designs and constructs molds, jigs, and other devices preparatory to materials processing. Assists in modifying new technologies to meet present materials development and processing needs.

(3) Utilizes various conventional application techniques, such as flame spraying, vapor deposition, foam casting, encapsulating, and others. May assist in developing new application techniques through use or modification of several or more steps of conventional techniques. Determines the effect and applicability of techniques developed to meet specified engineering requirements. Designs, constructs, and modifies nozzles and applicator devices for use in application of materials to aerospace hardware and components.

(4) Prepares documentation on technical and mechanical tasks performed, recording materials and mixtures used, processes and techniques employed, thermal ranges, vacuum pressures, and other related values employed which are pertinent to the assignment being performed.

(5) As a Technician, plans the sequence of conventional operations, calculating precision sizes, weights, measurements, tolerances, and dimensions, designing and constructing tools, fixtures, molds, and devices, utilizing standard and precision tools, equipments, and measuring devices, operating materials treatment, surface preparation, and standard materials testing equipment and apparatus.

The Engineering Technician (Materials-Development) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation period		250
Adapting polymers, refractory materials, composites, sealers, elastomers, and related materials to aerospace applications	2,300	
Molding, forming, bonding, coating, and curing of polymers	1,580	
Casting, encapsulating, ceramic and metal spraying, adhesive bonding, and foam casting of materials	720	
Abrasive machining hard metals and ceramics and grinding quartz and working with glass	600	
Installing thermocouples and orifices in various types of models and apparatus	875	
Documentation of results learned from test and experiments	454	
Soldering, brazing and welding of small parts	875	
Heat treating and nondestructive testing of various metals	1,224	8,628
		8,878
Related technical instruction		1,122
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his training, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

MECHANICAL ENGINEERING TECHNICIAN

The Engineering Technician Program (Mechanical-Experimental) shall be considered completed when the trainee has satisfactorily completed approximately 5 years of specified training and related study, including 8,878 hours of shop experience and 1,122 hours of classroom instruction.

Upon completion of his training, the employee shall be capable of performing the following duties:

(1) Receives work assignments from supervisor or researcher with specific instructions on objectives and desired results. Plans and develops own layout and approach to work assignment. Reviews plans and layout with supervisor to insure proper sequence, etc. Arranges for procurement of materials and support services as required.

(2) Reviews furnished drawings, sketches, and plans for missing details, incorrect measurements, and dimensions and assures for compatibility of materials, fits, proper spatial relationship, and similar factors before work is started to further assure that end product will meet desired quality, accuracy, and performance. Where no drawings are furnished, and prototype item may eventually become a production item, either for inhouse or contract manufacture, develops complete and detailed drawings.

(3) Suggests or recommends modifications to design, dimensions, configuration, materials to be used, processes, and techniques for better end product. Obtains concurrence and approval of recommended changes.

(4) Performs necessary "tooling-up" for accomplishment of work assignment. Designs and constructs jigs, fixtures, and support devices and apparatus. Adapts available machine tools to perform required machining or design modifications through use of adaptor jigs and fixtures or modified machining practices and techniques.

(5) Conducts trial and error experimentation with exotic and novel materials, subjects materials to various treatments and processes, develops modified techniques or approaches and tests for feasibility and adaptation, and conducts research on uses, application, adaptability, and feasibility of new materials, processes, and techniques to the work at hand.

(6) Subjects completed work item to environmental and operational testing as necessary. Consults with supervisor and researcher regarding any operational limitations or peculiarities of the mechanisms, materials, and design. Suggests or recommends further modifications to eliminate or alleviate any undesirable characteristics of the work item.

(7) In the course of work progress, relies heavily on training, experience, and skilled mechanical capabilities in reviewing and analyzing the work assignment, correcting or modifying design and configuration characteristics, developing detailed drawings, constructing and adapting tools, jigs, and fixtures, and employing the use of new or modified practices and techniques.

Engineering Technician (Mechanical-Experimental) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation period		250
Drill press	314	
Engine lathes	2,156	
Boring machines	280	
Milling machines	1,284	
Shaper and slotter	660	
Planer	193	
Grinders (miscellaneous)	310	
Bench work	499	
Use of precision measuring equipment	718	
Precision assembly	345	
Inspection	250	
Electrical discharge machine, hydrotel, tape mill, tracing lathes and mills, and other special equipment	619	
Shop work, general		
Dismantling, repairing, or assembling of machinery or equipment, and performance of related mechanical work	1,000	8,628
		8,878
Related technical instruction		1,122
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his trade, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

ENGINEERING TECHNICIAN

(Model-Aerospace)

Engineering Technician Program (Model-Aerospace) shall be considered completed when the trainee has satisfactorily finished approximately 5 years of specified training and related study including 8,878 hours of practical experience and 1,122 hours of related classroom instruction.

Upon completion of his training, the technician shall be capable of performing the following duties:

(1) Works with flexible materials, applying a working knowledge of the newer bonding and fastening techniques, assists in materials selection, layout, folding, and packaging of various flexible structures. Applies a limited working knowledge as to the application, physical properties, and characteristics of materials such as mylar, polyethylene, polypropylene vinyl, kaptan, dacron, nylon, rayon, silks, and with a wide variety of polyurethane foams and their uses.

(2) Works from design blueprints which merely show lofting lines in many cases, and/or works from precented models. Designs, devises, and/or constructs standard and nonstandard molds, jigs, and fixtures predicated upon known methods and techniques, and which are used in the handling, pouring, and application of plastics, fiber glass, resins, adhesives, and related compounds, or to facilitate buildup on ribs, spars, bulkheads, stages and sections of the framework to facilitate construction of a final composite model.

(3) Subjects materials to conventional processing techniques, such as heating, cooling, laminating, curing, bonding, coating, and other processes. Observes and assists in determining the effects and influences of processing on materials subjected to hostile environments by accurately recording his observations. Operates materials treatment and processing equipment and notes and records any problems that occur, deviations from expected norms, and attempts to resolve the problem. Conceives, designs, and constructs molds, jigs, fixtures, and like devices to facilitate development or processing of specific pliant or resinous materials. Makes limited contributions toward modifying new technologies to meet materials development and processing needs pertinent to his work assignment.

(4) Discusses material characteristics such as strength, shrinkage, flexibility, adaptability to environmental use, as well as general fabrication and joining techniques with project engineer or supervisor. Explains malfunction or poor operational or construction characteristics discovered in the working blueprints, or conflict between the design concept and actual construction and fabrication of the test model, and suggests practical means of overcoming these deficiencies.

Engineering Technician (Model-Aerospace) shall receive on-the-job training and related classroom instruction in accordance with the following schedule:

Training schedule	Time breakdown (approx. hours)	
Orientation and safety	250	
Indoctrination and usage of related machinery and equipment	1,254	
Use of precision measuring equipment and instruments	500	
Precision assembly, disassembly, alteration, modification, adjustment, testing, etc.	1,200	
Inspection (completed models, mechanical activation system, onsight activation system, contract and quality assurance monitoring)	200	
Hand tools design and development	500	
Designs of molds, patterns, and specialized tooling	1,500	
Technical design of model activation systems, devices, and mass distribution methods	600	
Materials and drawing specifications (selection, usage compatibility, dimensioning, testing, documentation)	500	
Model development (polymers, wood, pliant materials, laminates, etc.)	2,374	8,878
Related technical instruction		1,122
TOTAL		10,000

Dependent upon the workload of the Center and the speed with which the Technician masters the various phases of his training, the distribution of time may deviate from the above listing to facilitate the completion of the Center's work and the training of the employee.

NASA-Langley, 1973

INFORMATION CONCERNING

NASA LANGLEY RESEARCH CENTER'S ENGINEERING TECHNICIAN PROGRAMS

CSC (Civil Service Commission) address:

U. S. Civil Service Commission
Norfolk Area Office
415 St. Paul Boulevard
Norfolk, VA 23510

Call 1-800-582-8171 for Civil Service Test - Engineering Aid

Announcement No. PN 9-05 (if Norfolk CSC Region)

Place - Newport News Post Office or check with CSC in the area in which you live.

TYPE OF TRAINING

Engineering Draftsman

Aerospace Engineering Technician

Electrical Engineering Technician

Electronics Technician

*Avionics Technician

Engineering Technician
(Fabrication Development)

Engineering Technician
(Facilities Operations)

Engineering Technician
(Materials Processes)

Engineering Technician
(Mechanical Development)

Engineering Technician
(Aerospace Model Development)

*Engineering Technician
(System Environmental Specialist)

The training will consist of 5 years including a minimum of 1,122 hours of related instruction.

*Pending approval by U. S. Department of Labor, NASA-Langley Research Center, and NASA Headquarters.

SALARIES OF TECHNICIANS WHILE IN TRAINING

Grade		Promotion Schedule
GS-2	$ 5996 per annum	Entrance pay
GS-3	$ 6764 per annum	Completion of 6 months
GS-4	$ 7596 per annum	Completion of 1-1/2 years
GS-5	$ 8500 per annum	Completion of 2-1/2 years
GS-6	$ 9473 per annum	Completion of 3-1/2 years
GS-7	$10,520 per annum	Completion of 4-1/2 years

Instructions for Making Application to the
U. S. Civil Service Commission
to Take Exam for Entrance into
Engineering Technician Training Program

I. Read Engineering Technician Standards booklet.

A. This booklet explains:
1. The purpose of Langley Research Center's Engineering Technician Training Program (apprentice)
2. Areas of training available with a description of the on-the-job requirements and a training schedule for each area
3. The academic requirements

B. This booklet should be used to help a person determine whether or not Langley Research Center offers the type of training and job, desired by an individual, and if that person is willing to commit him/herself to the program for five (5) years.

II. Fill out Interest (IBM type) Card and send it to the U. S. Civil Service Commission whose address is on the back of the card.

III. There are two (2) additional sheets of paper that accompany the booklet. One lists the curricula, the other lists the areas of training and a pay scale for the program.

IV. Most courses that are taught in the Engineering Technician Training Program are taught by instructors from Thomas Nelson Community College, in classrooms at Langley Research Center. All courses are college accredited. Upon completion of the Engineering Technician Training Program the student can take additional courses at Thomas Nelson Community College and get an Associate in Applied Science Degree in either Electronic Technology, Mechanical Technology, or Engineering Drafting, depending on the curriculum he/she is in during his/her training. Some of these additional courses are:

Orientation
Human Relations
Economics
American Constitutional Government
Physical Education

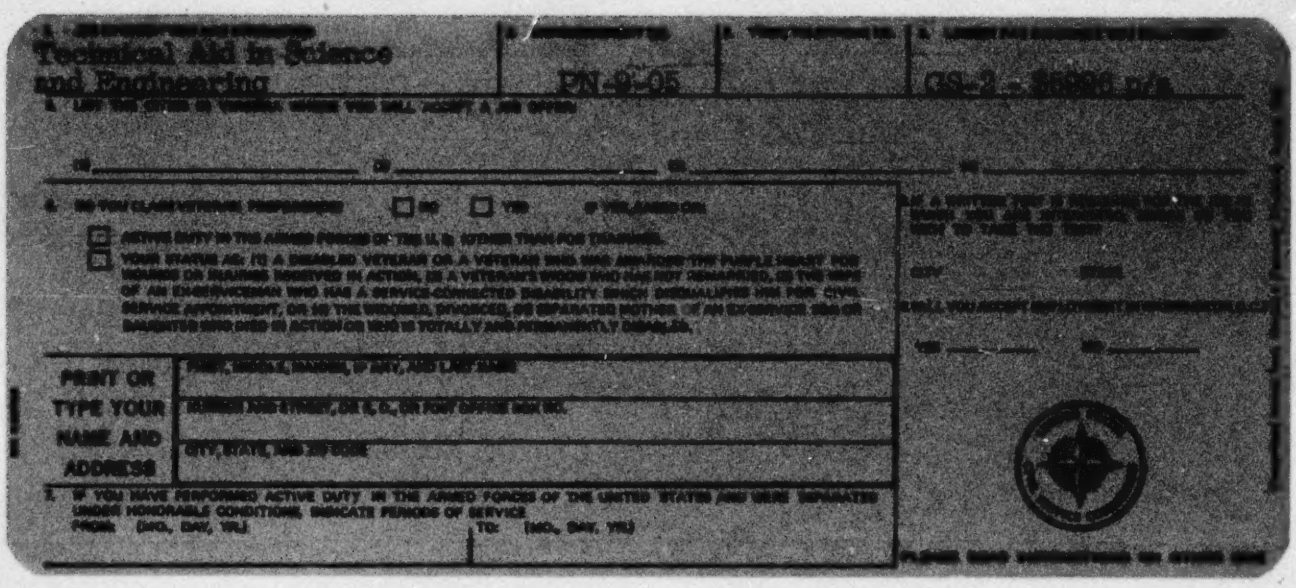
While in the training program all tuition, books, and other fees are paid for by Langley Research Center.

If additional information is needed, or there are other questions, please contact:

John C. Covington
Engineering Technician Training
Program Coordinator
Mail Stop 309
Langley Research Center
Hampton, VA 23665
Telephone: 827-2611

NOTE: Persons having prior military service and who have been released from Active Duty within the past 12 months and who have no more than 14 years total education, may be eligible to come into the Engineering Technician Training Program without taking the U. S. Civil Service Commission Exam. For additional information contact:

Ms. Betty B. Toole
Mail Stop 174
Langley Research Center
Hampton, VA 23665
Telephone: 827-3007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